REMARKS

Claims 1 and 18 have been amended to clarify that (1) a raw material gas contains silicon, carbon, and hydrogen in a molecule, and (2) in the curing step, the curable silicon carbide film is cured to reduce the dielectric constant. Claims 4 and 19 have been amended in accordance with the amendments to Claims 1 and 18, respectively. Claims 6 and 12 have been rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 24 and 25 have been added. No new matter has been added. Applicant respectfully requests entry of the amendments and reconsideration of the application in view of the amendments and the following remarks.

Rejection of Claims 1, 3, 4, 5, 7, 9, 10, 11, and 13-21 Under 35 U.S.C. § 103

Claims 1, 3, 4, 5, 7, 9, 10, 11, and 13-21 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over USPAB 2003/0194496 ("Xu") in view of USP 6,668,752 ("Yao").

The Examiner asserts that Xu teaches "continuously applying radio-frequency power to the reaction zone at a high hydrogen mixture ratio from that of the previous step (paragraph 64), thereby curing the silicon carbide film to give a dielectric constant lower than that of the curable silicon carbide film (paragraphs 22-24)." However, Xu in no way teaches the above step. Applicant believes that the Examiner misinterprets Xu:

First, in Xu, there is no "previous step" from which RF power is continuously applied in a curing step at a different mixture ratio. Xu's paragraph 63 states that when hydrogen gas is supplied at a flow rate of about 100 sccm, the resultant deposited silicon carbide layer had a dielectric constant of about 4.24. Xu's paragraph 64 states:

> [0064] A silicon carbide layer deposited with the same process but without having hydrogen gas deposited silicon carbide material having a dielectric constant of about 4.35. Further silicon carbide deposition having hydrogen flow rates of 200 sccm, 400 sccm, and 600 sccm, produced silicon carbide material having dielectric constants of 4.32, 4.54, and 4.71, respectively.

Xu does not teach two-step processing. Xu simply states that when hydrogen flow rates were 0, 100, 200, 400, and 600 sccm, the dielectric constant were 4.35, 4.24, 4.32, 4.54, and 4.71, respectively. Clearly, each process is a discrete process (each process provided each dielectric constant). Xu in no way teaches continuously applying RF power at a different mixture flow rate.

In contrast, in Claims 1 and 18, in a first step, a curable silicon carbide film is formed, and in a second step, the curable silicon carbide film is cured (the cured silicon carbide film has a reduced dielectric constant). Thus, in Claims 1 and 18, two steps are conducted to obtain a cured silicon carbide film, which is different from forming two separate films having different dielectric constants.

Second, in Xu, there is no curing step to cure a curable silicon carbide film. Claims 1 and 18 recite "thereby curing the curable silicon carbide film." By continuously applying RF power to the reaction zone having a lower mixture ratio, the curable silicon carbide is cured so that the cured silicon carbide has a reduced dielectric constant. This is not forming two separate films. Xu does not teach or even suggest such a separate curing step. Paragraphs 22-24 of Xu simply describe applicable ranges of parameters.

Third, Xu teaches changing the hydrogen gas flow, wherein at 100 sccm of hydrogen flow rate, the dielectric constant is low. In Claims 1 and 18, hydrogen gas is irrelevant. The raw material gas contains hydrogen in addition to silicon and carbon in a molecule, but this is irrelevant to supplying hydrogen gas.

Fourth, although the Examiner asserts that Yao teaches increasing inert gas flow and decreasing hydrogen concentration, Yao also does not teach or suggest a second step for curing the curable silicon carbide film as set forth in Claims 1 and 18.

In view of the foregoing, even if Xu and Yao are combined, all the claim limitations are not taught or suggested. Thus, Claims 1 and 18 could not be obvious over Xu and Yao. Claims 3, 4, 5, 7, 9, 10, 11, 13-17, and 19-21 are dependent either on Claims 1 or 18, and at least for the reasons above, these claims also could not be obvious over Xu and Yao. Applicant respectfully requests withdrawal of this rejection.

Rejection of Claims 2, 8, and 15 Under 35 U.S.C. § 103

Claims 2, 8, and 15 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Xu in view of Yao, and further in view of USPAB 2003/0049388 ("Cho").

Claims 2, 8, and 15 are dependent on Claim 1, and thus at least for this reason, these claims also could not be obvious over the prior art.

In addition, the Examiner asserts "Cho et al. regarding claim 2 teach the cured silicon carbide film has a stress change in the atmosphere or at 400°C and a leakage current when 1 MV/cm voltage is applied, which are about less than 1/2 of those of the curable silicon carbide film (paragraphs 104 & 106 Table II)." However, paragraphs 104 and 106 and Table II show that a SiC-based layer deposited with a small bias has a leakage current of 3.6 x 10^{-8} A/cm^2 at an electric filed of 1 MV/cm. Contrary to the Examiner's assertion, Cho makes no mention of a leakage current which is less than 1/2 of that of the curable silicon carbide film. Cho does not teach or suggest a second step for curing the curable silicon carbide film by continuously applying RF power at a reduced mixture ratio of raw material gas. In Claim 2, when the two-step processing is conducted, a leakage current of the cured silicon carbide film becomes less than 1/2 of that of the curable silicon carbide film (see Table 1 on page 19 comparing a single step process (Comparative Examples 1-3: 8.6, 1.7, and 1.0 x 10^{-8} A/cm^2) and a two-step process (Examples 1-2: 0.20 and 0.15 x 10^{-8} A/cm^2)). Thus, Claim 2 could not be obvious over the above prior art references.

The Examiner asserts "Regarding claims 8 and 15 discovering the optimum value or a result effective variable involves only routine skill in the art." However, because none of the references teaches or suggests the second step for curing with continuous RF power and at a reduced mixture ratio of raw material gas, routine work could not lead to Claims 8 or 15. Applicant respectfully requests withdrawal of this rejection.

Rejection of Claims 22 and 23 Under 35 U.S.C. § 103

Claims 22 and 23 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Xu in view of Yao, and further in view of USPAB 2004/0067308 ("Zheng"). Please note that Applicant assumes that although the Examiner states "Zheng et al. (USPAB 2003/0049388)", the correct publication number is USPAB 2004/0067308.

Claims 22 and 23 are dependent ultimately on Claim 1. As discussed in Claim 1, Claim 1 could not be obvious over Xu and Yao. Since Zheng does not teach or suggest the recitations of Claim 1, Claim 1 could not be obvious over Xu, Yao, and Zheng. At least for this reason, Claims 22 and 23 could not be obvious over the above references. Applicant respectfully requests withdrawal of this rejection.

New Claims 24 and 25

Claims 24 and 25 have been added. These claims have recitations similar to those of Claims 1 and 4 or Claims 18 and 19. Thus, these claims should be patentable over the prior art.

Allowable Subject Matter

Claims 6 and 12 have been objected to as being dependent upon a rejected claim, but would be allowable if rewritten in independent form. Claims 6 and 12 have been rewritten in independent form including all the limitations of the base claims and any intervening claims. Thus, it is respectfully submitted that Claims 6 and 12 are now allowed.

CONCLUSION

In light of the Applicant's amendments to the claims and the foregoing Remarks, it is respectfully submitted that the present application is in condition for allowance. Should the Examiner have any remaining concerns which might prevent the prompt allowance of the application, the Examiner is respectfully invited to contact the undersigned at the telephone number appearing below.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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